CLAIMS

What is claimed is:

1. An optical delay line filter comprising:

an optical splitter;

an optical loop having a first directional coupler and a second directional coupler, wherein the first directional coupler is in communication with the optical splitter and the second directional coupler;

a photodetector in communication with the first and second directional couplers; and

an impulse cancellation line coupled between the optical splitter and the photodetector.

2. The filter of claim 1, wherein the optical loop comprises optical fiber.

3. The filter of claim 1, wherein the photodetector comprises a first and second photodiode.

4. The filter of claim 3, further comprising an amplifier connected to the photodetector.

5. The filter of claim 3, wherein the impulse cancellation line is coupled between the optical splitter and the second photodiode.

6. The filter of claim 3, wherein the first photodiode is in communication with the first directional coupler, and the second photodiode is in communication with the second directional coupler.

7. An optical delay line filter comprising:

an optical loop provided with a first and second directional coupler, wherein a first optical signal circulates through the optical loop between a first directional coupler and a second directional coupler, and wherein each of the first and second directional couplers extract a percentage of light from the first optical signal each time the first optical signal passes through each of the first and second directional couplers, thereby generating a series of positive and negative signals;

a photodetector, the photodetector receiving the extracted light from the first and second directional couplers; and

an impulse cancellation line, the impulse cancellation line providing a second optical signal to the photodetector, the second optical signal canceling a first positive signal in the series of positive signals.

8. The filter of claim 7, wherein the optical loop comprises optical fiber.

9. The filter of claim 7, further comprising an amplifier coupled to the photodetector.

10. The filter of claim 9, wherein the photodetector comprises a first photodiode and second photodiode, the first and second photodiode connected so as to produce an electrical signal that is proportional to the algebraic difference of the extracted light from the first and second directional couplers.

11. The filter of claim 7, wherein the second optical signal and first positive signal reach the photodetector simultaneously, and wherein the amplitude of the second optical signal is equal to the amplitude of the first positive signal.

12. The filter of claim 7, wherein the first directional coupler has a coupling coefficient, the coupling coefficient of the first directional coupler being adjustable to adjust the percentage of light extracted from the optical signal in the first directional coupler.

13. The filter of claim 7, wherein the second directional coupler has a coupling coefficient, the coupling coefficient of the second directional coupler being adjustable to adjust the percentage of light extracted from the optical signal in the second directional coupler.

14. The filter of claim 7, further comprising a time delay determined by the spacing between the first and second directional couplers in the optical loop, said spacing being adjustable to adjust the time delay between positive signals in the series of positive and negative signals, and to adjust the time delay between negative signals in the series of negative signals.

15. The filter of claim 10, wherein the impulse cancellation line is in communication with the second photodiode.

16. A method for filtering an optical signal comprising the steps of:

circulating the optical signal through a first and second directional coupler;

extracting a percentage of light from the optical signal each time the optical signal passes through each of the first and second directional couplers, thereby generating a series of positive and negative signals; and

canceling a first positive signal in the series of positive signals.

17. The method of claim 16, further comprising a photodetector for receiving the extracted light from the first and second directional couplers.

18. The method of claim 16, further comprising the step of adjusting a coupling coefficient of the first directional coupler, thereby adjusting the percentage of light extracted from the optical signal in the first directional coupler.

19. The method of claim 16, further comprising the step of adjusting a coupling coefficient of the second directional coupler, thereby adjusting the percentage of light extracted from the optical signal in the second directional coupler.

20. The method of claim 16, further comprising the step of adjusting the spacing between the first and second directional couplers, thereby adjusting the time delay between positive signals in the series of positive and negative signals and adjusting the time delay between negative signals in the series of positive and negative signals.

21. The method of claim 17, further comprising an amplifier coupled to the photodetector.

22. The method of claim 21, wherein the photodetector comprises a first photodiode and second photodiode, the first and second photodiode being connected so as to produce

an electrical signal that is proportional to the algebraic difference of the extracted light from the first and second directional couplers.

23. An optical delay line filter comprising:

an optical splitter receiving an optical signal and providing a first optical output and a second optical output;

an optical loop having an optical path;

a first directional coupler having a first port, a second port, a third port, and a fourth port, the first port receiving the first optical output, the third port and the fourth port adapted to provide a portion of the optical path;

a second directional coupler having a first port, a second port, and a third port, the first port and the second port adapted to provide a portion of the optical path;

a photodetector in communication with the second port of the first directional coupler and the third port of the second directional coupler; and

an impulse cancellation line coupling said second optical output to the photodetector.

24. The filter of claim 23, wherein said first directional coupler has a first coupling coefficient, the first coupling coefficient determining an amount of light coupled from the third port of the first directional coupler into the optical loop and wherein the second directional coupler has a second coupling coefficient determining an amount of light coupled from the optical loop to the third port of the first directional coupler.

25. The filter of claim 23, wherein said first directional coupler has a first coupling coefficient, the first coupling coefficient determining an amount of light coupled from the second port of the first directional coupler to the photodetector and the second directional

coupler having a second coupling coefficient determining an amount of light coupled from the second output port to the photodetector.

26. The filter of claim 23, further comprising a time delay determined by the spacing between the first and second directional couplers in the optical loop.

27. The filter of claim 25, further comprising an amplifier coupled to the photodetector.

28. The filter of claim 27, wherein the photodetector comprises a first photodiode and second photodiode, the first and second photodiode being connected so as to produce an electrical signal that is proportional to the algebraic difference of the light coupled from the second port of the first direction coupler to the photodetector and the light coupled from the second output port of the second directional coupler to the photodetector.

29. The filter of claim 28, wherein the impulse cancellation line is in communication with the second photodiode.